

Helios Mission Support

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TDA Mission Support

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This article reports on activities of the DSN Network Operations Organization in support of the Helios Project from 15 August 1978 through 15 October 1978.

I. Introduction

This article is the twenty-fourth in a continuing series of reports that discuss Deep Space Network support of Helios Mission Operations. Included in this article is information on the upcoming eighth perihelion of Helios-1 and the sixth perihelion of Helios-2, science experiments, 22-bit error polynomial code (EPC) testing and other mission-related activities.

II. Mission Operations and Status

On 7 September 1978, commands were sent to Helios-1 to turn on Experiment 9. Experiment 9 had been off since 2 July 1978 due to a limitation in available regulator output power. The experiment was fully configured and science data had been received for more than one hour when DSS 44 (Honey-suckle Creek, Australia), which was tracking the spacecraft, reported a loss of downlink at 22:50:25 Universal Time Coordinated (UTC) on 7 September. As a result, a spacecraft emergency was declared at 23:10 UTC and 64-meter coverage requested. On 8 September at 00:39:37 UTC, DSS 43 (Tidbinbilla, Australia) acquired the downlink. After evaluat-

ing the first telemetry data, it was discovered the spacecraft's tenth regulator switch had occurred, which caused the turn-off of the non-essential bus, changed numerous status bits and off pointed the High-Gain Antenna. After sending several hundred commands, the spacecraft and its experiments, except for Experiment 9, was reconfigured with the High-Gain Antenna back on Earth point. On 8 September 1978 at 09:00 UTC, the emergency was lifted. Two possible causes for this regulator switch have been identified:

- (1) The switch might have been triggered by a solar event that was reported at the Space Environments Services Center, Boulder, Colorado, at approximately the same time period.
- (2) Experiment 9 does not have a current limiter for protection and a stuck stepper motor might have caused an overload condition. Experiment 9 will be left off until the circumstances can be clarified with the experimenter.

On 26 October 1978, the Helios-1 spacecraft will enter its eighth perihelion period, which will last until 3 November.

More information concerning this event will be recorded in future articles.

The Helios-2 spacecraft has performed nominally for this period with no significant occurrences or problems. The spacecraft entered its sixth perihelion period on 8 October 1978. Helios-2 entered blackout on 9 October while being tracked by DSS 67/68 (Weilheim, Germany). This earlier than expected blackout was probably due to high solar activity. The spacecraft was at a Sun-Earth-Probe (SEP) angle of 4.1 degrees at blackout. Assuming a symmetrical exit angle, the spacecraft was configured for a 13-day unattended operation period with memory storage covering. Helios-2 was configured in data mode 4, format 3, bit rate of 8 bits per second (bps) and sequence 17. Blackout exit is scheduled to occur on 22 October 1978. As with Helios-1, more information will be available for a future article.

Helios-2 also passed its 1001st day in orbit on 12 October 1978.

Overall coverage for Helios-1 and Helios-2 for this period is listed in Table 1.

III. Special Activities

A. Support of On-Board and Ground Experiments

In conjunction with the perihelion and superior conjunction periods, science data will be collected during times discussed earlier. The prime data types will be faraday rotation data and ellipticity data for Experiment 12. Also solar wind data will be collected during the same period.

B. German Space Operations Center (GSOC) Conversion to the 22-Bit Error Polynomial Code (EPC) and the Mark III Command System

As reported in the last article (Ref. 1), testing has continued on the 22-bit EPC interfaces and Mark III Command System throughout this period. Overall, the testing has gone well. On 3 October, the first demonstration track was performed by DSS 44 while tracking Helios-1 to verify that GSOC was capable of processing telemetry, monitor, and command data while in the 22-bit EPC mode. The monitor software at the Network Operations Control Center (NOCC) was, unfortunately, not available in time for this test, and the Mark III Command System performance was hampered by certain anomalies discovered in the station's Command Processor Assembly's test software. These anomalies affected command transmission to the spacecraft and are being corrected. The interfaces between GSOC, JPL, and DSS 44 worked well in the 22-bit EPC mode, and telemetry and command data flowed without difficulty. Another demonstration was conducted on 5 October with basically the same results. On 8 October, demonstration tracks with DSS 62 (Cabreros, Spain) tracking Helios-1 and DSS 63 (Madrid, Spain) tracking Helios-2 were conducted. The purpose here was to verify that GSOC could process both Helios-1 and Helios-2 telemetry data, while in the 22-bit EPC configuration. This test was successful with no problems encountered. The most recent test was a telemetry and monitor test with DSS 44 tracking Helios-1 and DSS 14 (Goldstone, California) tracking Helios-2. This test followed the same format as the telemetry test above, but with the addition of one monitor data stream from each station. This test proved successful and GSOC processed both telemetry and monitor data from each station. Future tests (demonstration tracks) are scheduled to check out the Mark III Command System following the correction of DSN software. These tests will be reported in a future report.

References

1. Goodwin, P. S., Jensen, W. N., and Rockwell G. M., "Helios Mission Support," in *The Deep Space Network Progress Report 42-47*, pp. 26-28, Jet Propulsion Laboratory, Pasadena, CA, 15 October 1978.

Table 1. Helios tracking coverage

Month	Spacecraft	Station type	Number of tracks	Tracking time (h:min)
August	Helios-1	26 meter	31	147:13
		64 meter	0	00:00
	Helios-2	26 meter	4	20:47
		64 meter	25	84:41
September	Helios-1	26 meter	27	139:40
		64 meter	2	8:25
	Helios-2	26 meter	0	00:00
		64 meter	21	91:02